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Introduction

The **Teacher's Resource Kit** is free for Australian schools (and other learning institutes) and includes poultry-related educational resources developed by the Poultry CRC, the Australian Chicken Meat Federation, the Australian Egg Corporation Limited and the Rural Industries Research and Development Corporation (RIRDC) Chicken Meat Program.

This folder of lesson plans and worksheets for teachers forms part of this kit. The information and worksheets provided within can also be used as a resource for schools wishing to participate in the World's Poultry Science Association (WPSA) Schools Poultry Competition. For more information about this competition go to

http://www.poultryhub.org/

and search under the Education button.

Useful Websites

www.poultryhub.org - Poultry Hub www.virtualchicken.org – explores the reproductive system of a hen, showing the formation of an egg www.chicken.org.au - Australian Chicken Meat Federation (ACMF) www.aecl.org - Australian Egg Corporation Limited (AECL) http://eggs.org.au - The home of eggs online (AECL) www.enag.org.au – Egg Nutrition Advisory Group www.incredibleegg.org – Home of the incredible edible egg (US) http://thinkegg.com – Egg facts and recipes www.acgc.org.au - Australian Chicken Growers Council www.ecochooks.com.au – products and services for backyard poultry

www.agriproducts.com.au/agri/poultry-chook_book.html - The Chook Book provides an introduction to home flock management and has been developed as a guide for the rearing and feeding of laying hens www.farmissues.com/virtualTour - includes virtual tours of Canadian poultry farms www.wikipedia.org – offers many poultry related articles

Additional Resources (Not in Kit)

Building the Poultry Penthouse Book - Published by NSW Department of Primary Industries (ISBN: 073130604-X) Available from www.shop.nsw.gov.au Getting started in free range poultry Book - Published by NSW Department of Primary Industries (ISBN: 978-0 7313 0623-7) Available from www.shop.nsw.gov.au The Chicken Health Handbook Book - Published by Storey (ISBN: 0-88266-611-8) Available from www.storey.com Storey's Guide to Raising Ducks Book - Published by Storey (ISBN-13: 978-1-58017-258-5) Available from www.storey.com



Anatomy and Physiology





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Skeletal system and brain



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Pulmonary system and air sacs



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Pulmonary system (left half) plus heart



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25	50
27	51
29	52
30	53



Anatomy of the chicken: COMPUTER INTERACTIVE ACTIVITY Use the CD Anatomy of the Chicken to label the following diagram:

Gastrointestinal tract (left half)



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63	
64	
65	



Gastrointestinal tract (right half)



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55			
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66			
67			



Anatomy of the chicken: COMPUTER INTERACTIVE ACTIVITY Use the CD Anatomy of the Chicken to label the following diagram:

Genitourinary system and right half of skeleton



60			
63			
67			
68			
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72			
73			
74			
75			



Musculature system and nephron



76	-		
77			
78			
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80			
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83			
84			
85			



Anatomy of a Chicken

Using the following words, label the parts of the chicken below:

Heart, ovary, proventriculus, cloaca, gall bladder, nostril, larynx, liver, pancreas, small intestine, large intestine, gizzard, oviduct, kidney, caeca, lungs, brain, nostril, duodenal loop, trachea, oesophagus, crop, spleen, eye





The Physiology of a Chicken

Use the website <u>http://www.poultryhub.org/</u> and links under the button labelled Physiology to research the function of each of the following body parts of a chicken.

Body Part	Function
Skin	
Feathers	
Skeleton	
Muscles	
Eye	
Droin	
Brain	
Lungs	
Liver	



Ovary Oviduct	
Ovary Oviduct	
Ovary Oviduct	
Oviduct	
Oviduct	
Heart	
Beak	
Сгор	
Proventriculus	
Gizzard	
Small Intestine	
Large Intestine	
Caeca	
Cloaca	



Comparison of Body Parts of High and Low-Producing Egg-Type Hens

Use the images below or the High and Low-Producing Egg-Type Hens Powerpoint presentation on the Teachers Resource Kit CD to outline the visual differences between high and low-producing egg-type hens.

HIGH-PRODUCING HENS

LOW-PRODUCING HEN





Vents

Head

Bottoms of feet

Fronts of shanks & tops of toes

Backs of shanks

Variations in Plumage Condition





HIGH-PRODUCING HENS	LOW-PRODUCING HEN
Vents	Vents
Head	Head
Bottoms of feet	Bottoms of feet
Fronts of shanks & tops of toes	Fronts of shanks & tops of toes
Durch a sefect and a	Dual a sí shawla
Backs of snanks	Backs of snanks
Variations in Plumage Condition	Variations in Plumage Condition
variations in I lamage Condition	variations in 1 tunage Condition

Animal Health and Welfare



Definitions used in Health Management

Use the website <u>http://www.poultryhub.org/</u>to fill in definitions in the table.

Term	Definition
Disease	× · · · · · · · · · · · · · · · · · · ·
Agent of disease	
T	
infectious agents	
Contagious disease	
Contagious disease	
Infective organism	
Host	
D (1	
Pathogen	
Dorosito	
Vector	
Intermediate host	
Endemic	
Notifiable diseases	
Notifiable diseases	
Biosecurity	
v	



Poultry Health

Use the website http://www.poultryhub.org/ to complete this activity.

List five causes of disease in poultry.

List three non-infectious causes of diseases in poultry.

List eight infectious causes of diseases in poultry.

What are internal parasites and name three that are harmful to poultry?

What are external parasites and how can they harm poultry?

List five management practices that help in the prevention of disease.



Common Pathogens and Parasites of Poultry

Research the **symptoms and treatments** for each of the common pathogens and parasites of poultry. Look at pages under the Health button in <u>http://www.poultryhub.org/</u>



TREATMENTS



STIVIPTOIVIS

TREATMENTS

Picture source: Nicholls, C & Paterson, J (2008) The story of CHICKEN: THE WORKBOOT SERIES, p13, Kondinin Group, WA





SYMPTOMS		

TREATMENTS



SYMPTOMS			

TREATMENTS

Picture source: Nicholls, C & Paterson, J (2008) The story of CHICKEN: THE WORKBOOT SERIES, p13, Kondinin Group, WA







SYMPTOMS		

TREATMENTS

Picture source: Nicholls, C & Paterson, J (2008) The story of CHICKEN: THE WORKBOOT SERIES, p13, Kondinin Group, WA



Poultry Health Management

Read http://www.poultryhub.org/health/health-management/

to find out about the principles and causes of infectious diseases. For each of the eight main categories of infective organisms, find examples of each that affects poultry. You can find more information about the categories of disease at

http://www.poultryhub.org/health/disease/types-of-disease/

Categories of infective	Examples
organisms	
Bacteria	
Viruses	
Chlamidia	
Fungi	
Mycoplasmas	
Protozoa	
Internal parasites	
External parasites	

Using the information above, answer the following questions:

1. Bacteria

What are the two ways that Pathogenic bacteria can harm the body systems?

What class of drugs is commonly used to treat bacteria?

2. Viruses

What are viruses reliant upon to live and reproduce?



How can the threat of viruses be managed in a poultry flock?

3. Fungi

Fungi absorb nutrients from living or dead organic matter that they grow on. What are the two ways fungi infections cause harm to poultry?

4. Protozoa

What part of a chicken's body is affected by diseases caused by protozoa?

What are two ways that diseases caused by protozoa are usually treated?

- 5. What is the usual treatment of diseases caused by Chlamidia and Mycoplasmas?
- 6. List five management practices and how they help maintain a healthy flock?

7. Make a list of things to look for that indicates that a bird is unhealthy.



Disease

The spread of infection

The extent to which an infection will spread throughout a population depends upon its size and density, the number of individuals in the population who are susceptible, the environmental conditions and the virulence of the infection. We can reduce the risk of disease spreading by changing any of these factors. Examples of this would be vaccinating to boost immunity in the host, isolating diseased stock to make it more difficult for disease to spread, and spraying for biting insects that carry disease.

Where a disease spreads rapidly through a population it is called an epidemic. A disease may stay in a population at very low (or endemic) levels and only flare up occasionally.

How infection takes hold

Pathogens can gain entry to the body by direct contact, airborne organisms, ingestion of contaminated food, biting insects, cuts and abrasions and inheritance from parent to offspring.

A convenient way of thinking about diseases is by using a concept called the "Disease Triangle". Disease represents the interaction between three factors (the three corners of the triangle): a susceptible host, a pathogen (disease causing organism) and a favorable environment. If all of these factors are present, disease results; if one or more of the factors are not present, then disease does not occur.



The Disease Triangle



Methods of disease control can be thought of as modifying the disease triangle by reducing or eliminating one of the corners of the triangle. For example, if you vaccinate animals against clostridial diseases you are eliminating the "susceptible host" and can thus reduce or prevent disease. Similarly, for bacterial infections, by using antibiotics, you can reduce or eliminate disease because you are eliminating the pathogen. Finally, you can reduce or eliminate a "favorable environment" for something like internal parasites by removing the habitat that the parasite needs to complete its lifecycle.

Use the websites http://www.poultryhub.org/health/health-management/ and

<u>http://www.poultryhub.org/health/disease/types-of-disease/coccidiosis/</u> to find out about the prevention of infectious diseases.

Use the information about the Disease Triangle and the websites above to answer the following questions for coccidiosis in poultry:

1. Favorable environment

What are the factors that affect poultry health (and make them susceptible to disease)?

What are the factors that affect coccidiosis viability?

2. Pathogen

What is the coccidiosis cycle?

How is it transmitted host to host?



How would you assess the level of coccidiosis in the host and in the environment?

3. Susceptible host

What are the symptoms of coccidiosis?

How do affected poultry help to complete the coccidiosis cycle and spread the disease?

What influences the level of immunity to coccidiosis in poultry?



Vaccination

Read how vaccines work then research a definition for the following:

How vaccines work	Immunity:
 A mild or inactivated (killed) strain of the disease-causing organism is given to chicks. The chicks' immune system produces antibodies which react to the foreign organisms. The disease-causing organism is destroyed and the antibodies remain. 	Antibodies:
Antibodies remain. In later-life a wild strain of the disease-causing organism may invade the chicken's body. Before it can cause disease, the antibodies attach to the disease-causing	 Marek's disease:
organism. The disease-causing organism is destroyed and the antibodies remain.	 Newcastle disease:

Picture source: Nicholls, C & Paterson, J (2008) <u>*The story of CHICKEN: THE WORKBOOT</u>* <u>SERIES</u>, Kondinin Group, WA</u>





In the Resource Kit you will find a DVD entitled **From Hatchery to Home** produced by the **Australian Chicken Meat Federation Inc.** Visit <u>http://www.chicken.org.au/page.php?id=20&item=4</u> on the Australian Chicken Meat Federation website. You might want to download the

National Farm Biosecurity Manual from this page. The objectives of biosecurity are outlined.

Biosecurity

Answer the following questions:

1. Outline a definition of biosecurity.

2. What effect can diseases have on a poultry operation?

3. What do you think is meant by "managing risk"?

4. What do you think is meant by "risk assessment"?

- **5.** Compare various answers from class members for questions 3 and 4. Write these responses on a whiteboard or similar. As a class, make a list of suggestions as to how a meat chicken farmer might go about controlling the major routes of disease transmission. There are many ideas that could come from watching the 'From Hatchery to Home' DVD. When compiling the list, consideration should be given to measures that could realistically be taken to protect against disease entering a flock because of; transfer of birds from farm to farm, wild birds or their droppings, domestic pets, insects, rodents, people and their clothing or shoes, vehicles and other equipment, transmission by air, birds drinking contaminated water.
- 6. Write an extended response (100 200 words) to the statement: "The most compelling reason for a livestock farmer to comply with all biosecurity regulations is the economic one. Disease can not only wipe out stock, but can also wipe out the considerable investment made into breeding and rearing."



Major Exercise

Take a close look at pages 9 to 15 of the National Farm Biosecurity Manual, as well as the documentation records in the appendices. Divide the class into three groups. Have each group take one of the following areas relating to a poultry farm:

• Facilities on the farm • Personnel on the farm • Operational standards

Using the resource material from the ACMF document and the 'From Hatchery to Home' DVD, each group is required to focus on their area and carry out the following tasks:

- **1.** Make a list of:
 - routine procedures that should be incorporated into the everyday running of the poultry farm to minimise the risk of infection;
 - emergency procedures that should be implemented on a poultry farm, in addition to routine procedures, if there is a disease outbreak.
- 2. Present your lists to the rest of the class in a 10 15 minute oral presentation, supplemented by a handout or other visual aid(s) eg, a PowerPoint presentation.

You should also emphasise the importance of keeping accurate records, with reference to examples of documentation, such as those found in the appendices of the ACMF document.

- **3.** Prepare a 5 minute question and answer quiz, or short test, to give to your audience immediately after the presentation. This will give your group a means of evaluating the effectiveness of your presentation.
- **4.** Prepare a poster for display in the classroom that outlines the procedures for both routine and emergency situations.



AUSTRALIAN CHICKEN MEAT FEDERATION INC. In the Resource Kit you will find a DVD entitled **From Hatchery to Home** produced by the **Australian Chicken Meat Federation Inc.**

The Use of Antibiotics

Download the ACMF antibiotic policy, on the Australian Chicken Meat Federation website. <u>http://www.chicken.org.au/files/ACMF_Antibiotics_Policy.pdf</u>. Using information from this document, answer the following questions:

- 1. What are antibiotics? ____
- 2. In chicken meat production, two types of antibiotics are used therapeutic agents and prophylactic agents. What is the difference between them?
- 3. What is the industry's position in relation to antibiotics?
- 4. What does it mean when bacteria become resistant to antibiotics?
- 5. What does JETACAR stand for? Why was it established?
- 6. Which organisations are involved in implementing the strategies for the responsible use of antibiotics in animals?
- 7. Summarise the six guiding principles for the chicken meat industry to ensure that the development of antibiotic resistance is minimised.
- 8. To what does a withholding period refer? Why are withholding periods so important in chicken meat production?
- 9. What is the chicken meat industry's view on alternative methods of treatment to antibiotics? Why does it take this view?

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10. Are hormones used in chicken meat production in Australia?





In the Resource Kit you will find a DVD entitled **From Hatchery to Home** produced by the **Australian Chicken Meat Federation Inc.**

Avian Influenza

Search <u>www.chicken.org.au/page.php?id=23</u> and <u>www.outbreak.gov.au</u> (Australian Government website) for the sections on Avian Influenza and any other reliable sources of information you can access.

Cover some or all of the following aspects:

- What is Avian Influenza?
- How is it carried and passed on to birds?
- Is it the same disease as human influenza?
- Has Avian Influenza ever appeared in this country?
- Have people in Australia ever been affected by Avian Influenza?
- Which strain is the one commonly referred to as 'bird flu'?
- Have we ever had this strain of Avian Influenza in Australia?
- In which parts of the world has this strain been identified since 2003, and what has been its impact on birds and humans in these parts of the world?
- Does this strain only affect chickens?
- Are wild birds affected?
- Can this strain ever be passed on to humans? If so, by what means?

• Has anyone around the world ever caught this strain from eating properly cooked chicken products?

• What evidence is there that Australia is well prepared to prevent any outbreak of Avian Influenza (bird flu)? What safeguards are in place?

• How can consumers be confident that the chicken meat they purchase is safe?

Present your findings in one of the following ways:

- a written assignment
- a radio or television documentary
- a PowerPoint demonstration
- a webpage, complete with links to other useful websites
- an information brochure for chicken meat consumers





In the Resource Kit you will find a DVD entitled **From Hatchery to Home** produced by the **Australian Chicken Meat Federation Inc.**

AFTER viewing the DVD write your responses to the following.

Animal Welfare

1. After viewing the 'From Hatchery to Home' DVD make a sketch of a shed used to house meat chickens on a commercial rearing farm. Show the typical dimensions of the shed and the location of feed silos. (You may need to view this section of the program again).

2. Make a list of the equipment/materials used for the following purposes in chicken sheds.

- flooring _____
- ventilation and temperature control
- feed and water provision ______
- **3.** Visit <u>www.chicken.org.au/page.php?id=44</u> on the ACMF website. Read through the information on this webpage and answer the following questions.
 - a) What is meant by a Code of Practice?

b) In what ways do high standards of bird welfare, high levels of flock performance and economic performance go hand in hand?

c) There are three strong motives listed for industry to look after the birds in its care in a welfare-friendly manner. Write each of these in your own words.



Poultry Industry Teaching Resource

Visit <u>www.chicken.org.au</u> and locate the section where conventional free range and organic production systems are compared. What is the difference between free range chickens, organic chickens and conventionally farmed commercial meat chickens?
Download the Model Code of Practice for the Welfare of Animals-Domestic Poultry from
www.chicken.org.au (in the section on Bird Welfare)
a) The CSIRO published the Code of Practice, but which government body was responsible for compiling it?
b) Using the contents page as a reference, outline the areas covered by this Code of Practice.
c) In the section on 'Housing', two systems of housing for chicken meat production are defined – what are they?
d) Read the section on 'Equipment'. How often must feed and water equipment be checked? Why do you think there is the requirement for back-up systems for environmenta control equipment?
e) Read the section on 'Ventilation'. What type of gas is described as an indicator of a build-up of noxious gases? What level of this gas (parts per million) in enclosed buildings

Food Production


The Structure of an Egg

Research the structure of an egg and label the following diagram using the list below.

Air cell, Chalaza, Germinal disc, Shell membranes, Shell, Thick albumen, Thin albumen, Vitelline membrane, Yolk





Egg components

What percentage of the total egg weight is yolk?
The yolk consists of percent water, percent fat, percent protein.
What other nutritional elements are found in the yolk? and
The colour of the yolk is determined by
A round white spot called the germinal disc can be seen on the surface of the Yolk. In eggs this is where the chick starts to develop.
In eggs produced for human consumption, what happens to the germinal disc?
What is the purpose of the vitelline membrane?
What is the purpose of the chalaza?
The albumen is% of the egg. It consists of% water and% protein.
What is the purpose of the albumen?
What role does the shell membrane play?
What role does the shell play?
The shell makes up% of the weight of an egg. About 98% of the shell is The other main elements found in the shell are
How does the air cell form in an egg?



It all starts with an Egg

Resources: <u>http://www.poultryhub.org/</u> and the DVD – It all starts with an EGG: The journey of Australian eggs from farm to table. Watch the DVD and answer the following questions:

How do eggs help us?

Where are eggs produced?

a.	
b.	
c.	

How many eggs do Australians eat every year?_____

What are the benefits of chickens being in cages?

What are the benefits of chickens being in barns?

What are the benefits of chickens being free-range?

What types of ingredients are in chicken feed?



Poultry Industry Teaching Resource

What does a veterinarian do?

When visiting a farm how do you stop disease from spreading?

How long does it take chickens to hatch?_____

How old is a chicken when it first lays an egg?_____

How often does a chicken lay an egg?_____

Draw a farm where the chickens are kept in cages.



Draw a farm where chickens are kept in a barn.

Draw a farm where chickens are kept free-range.



Chicken Layer Industry

Resources: <u>http://www.poultryhub.org/</u> Using the above web site and others, research the chicken layer industry.
Approximately, how many layer hens are in Australia?
How many eggs are produced each year?
On average how many eggs does every Australian eat in a year?
What are the main reasons that eggs are discarded?
Outline the main differences between extensive , semi-intensive and intensive egg production?
List the many ways that eggs are marketed in supermarkets.
Cage layer hens produce approximately % of the eggs produced in Australia. Is this percentage increasing or decreasing? Why?
What are the differences in the eggs produced by cage layers, barn layers and free-range layers?
What are the benefits of eating chickens eggs?
Why should people be careful about eating eggs?



Research the history of the egg production industry. Write a short (200 - 250 words) report on the industry?

What are the requirements for eggs to be certified organic?

 What is the average cost of producing a dozen eggs? ______

 What are the main factors that affect the cost of production? _______





Production of Chicken Meat

When you eat chicken do you ever wonder how it was produced?

Use the following words to label the diagram.

Breeder farms, Consumer, Distributor, Feed mill, Food service, Processing plant, Hatchery, Meat chicken rearing farms, Processing plant, Quarantine facility, Retail outlet



Picture source: Nicholls, C & Paterson, J (2008) The story of CHICKEN: THE WORKBOOT SERIES, Kondinin Group, WA



To produce chicken meat there are many stages involved. Draw a line to match the stage in

production, the picture and the description.

Information Source: Paterson, J (2008) The story of CHICKEN: THE WORKBOOT SERIES, Kondinin Group, WA



Poultry Y CRC Y



Nutrition

Use the website <u>http://www.poultryhub.org/nutrition/nutrient-requirements/</u> to research the nutritional requirements of chickens and complete the table

Class of Nutrient	Why is the nutrient required?
Carbohydrates	
Fats	
Proteins	
Vitamins	
Minerals	
Water	

Explain why calcium, phosphorous and vitamin D are important in the diet of a laying hen?

What factors affect the nutrient requirements of poultry?

What is the rule of thumb regarding water intake compared with feed intake?

What are the main factors that affect water intake in chickens?

What is the typical water intake of 1000 layer pullets when 4 weeks old? g	g/day
--	-------

What is the typical water intake of 1000 laying hens in full production? _____ g/day

What is the typical water intake of 1000 broilers at 8 weeks old _____ g/day

Complete the table below



Term	Meaning
Metabolism	
Digestion	
Digestion	
Balanced daily	
ration	
Feed formulation	
Total digestible	
nutrients	
Essential amino	
acid	
Fatty acid	
Hormone	
Trace minerals	
In chicken feed, w	hat are the main sources of .

Energy _____ P

rotein			

What are the main cereals used in chicken feed?

What are the main vegetable protein sources and animal protein sources used in chicken feed?



In the Resource Kit you will find a DVD entitled **From Hatchery to Home** produced by the **Australian Chicken Meat Federation Inc. BEFORE** viewing the DVD write your responses to the following. Poultry CRC

- 1. How often do you eat chicken?
- 2. In what forms do you eat it eg, roasted; in soups and casseroles; stir-fries; take-away meals; in sandwiches?
- 3. Do you think chicken is a popular food type in this country? What makes you think this?
- **4.** In what forms is chicken sold in supermarkets, butchers and delicatessens? Describe some of the ways you have seen chicken sold in these outlets for preparation and consumption at home.

5. Indicate whether you consider the following statements to be true or false:

a) Chickens we buy for eating are the same type of chickens as those that produce eggs sold for human consumption. T / F

- b) Chicken meat has relatively low levels of fat contained in it. T / F
- c) All chicken meat sold in Australia for human consumption is grown in Australia. T / F
- d) Meat chickens tend to be large birds because of the way they are bred and fed. T / F
- 6. How much chicken meat do you think is sold in Australia each year? *The retail value is estimated to be closest to:*a) \$1 billion
 b) \$2 billion
 c) \$3 billion
 d) \$4 billion
- 7. What do you think chickens grown on a commercial scale for their meat are fed?
- 8. In what ways do you think farms that grow chickens for human consumption might protect the birds against disease?_____





In the Resource Kit you will find a DVD entitled **From Hatchery to Home** produced by the **Australian Chicken Meat Federation Inc. WHILE** viewing the DVD write your responses to the following. Poultry CRC

Introduction to the Chicken Meat Industry

- **1.** How many kilograms of chicken does the average Australian eat in one year? _____kg.
- **2.** What was the equivalent figure back in 1965? _____kg.
- **3.** Around 470 million meat chickens are processed in a year by the Australian chicken meat industry. What is the estimated weight of chicken meat produced from this many chickens? ______ tonnes.
- **4.** Complete this table:

Approximate gross value of chicken meat production per year.	
Estimated retail value of chicken meat industry per year.	
Number of jobs supported by the chicken meat industry.	

5. Complete the sentence:

a) Meat chickens are sometimes called ______. They are very different from the

chickens bred to produce _____

b) Regarding this last statement, in what ways are they different? _____

6. What is meant by the statement that 'the chicken meat industry is highly vertically integrated'?

Breeding and Breeder Farms

- 7. How do the great-grandparents of the chickens that we eat in Australia arrive into the country?
- 8. State how many birds of each generation great-grandparents, grandparents and parents of meat chickens grown for human consumption might typically be out on the farms in Australia at any one time.

9. How long are the parents of meat chickens kept? ______ weeks. Approximately how

many fertile eggs are collected from them in this time?

10. The breeder flocks are kept in large sheds and are raised on the floor. What is the floor covered with?



11.	Breeder flock	ts are kept in	sheds with r	nest boxes	when they	reach maturity	y – at about 20
	weeks of age.	Why are they	kept here,	and why a	re males an	d females kep	t together?

12. Why is the feed for breeder chickens different from that given to those birds raised for meat consumption?

Hatcheries

13. Why might fertile eggs be fumigated before being incubated?

14. (Complete	the	sentence:
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The two stages in the incubation process are called	the
stage and the	_stage.

15. How many days are eggs incubated at each of these stages?

16. What is the purpose of grading the chicks after they hatch?

17. What does the term hatchability mean?

18. Identify four factors that can affect hatchability.

Feed Mills and Rearing Farms

19. What happens at a feed mill?

20. What role do poultry nutritionists play?



21. Identify the two grains that make up around 60 per cent of meat chickens' feed.

- 22. Other than grains, what else is in the feed?
- **23.** Complete the sentence:

In producing breeder chickens and meat chickens, no _____

24. Complete the sentences:

Chickens that are raised for meat consumption are never kept in ______.

They live on the ______ of large chicken sheds, which are covered with comfortable

_____ material.

25. What could the dimensions of a typical meat chicken rearing farm shed be?

26. Up to how many day-old chicks could be housed in one of these sheds?

27. What does brooding mean?

28. Describe how the temperature inside the chicken sheds is controlled.

29. Why are all meat chicken farmers required to have biosecurity practices in place?

30. When might flocks be treated with an antibiotic?

31. What measures do farmers use to prevent disease or infection?



Poultry Industry Teaching Resource

Processing Ready For Consumption

32. At what age are meat chickens ready for processing?

33. How do chickens get from the farm to the processing plant?

34. Identify four steps taken after live birds arrive at a processing plant.

35. Fill in the missing numbers:

The largest chic	ken meat processing plant pro	cesses	birds per week, and
employs	people.		

36. What does HACCP stand for, and what is the purpose of HACCP?

37. What should you look for to ensure chicken has been adequately cooked?

38. Identify four factors that have led to the price of chicken not increasing as much as the prices of other meats over recent decades.

39. Chicken meat is a good source of which dietary nutrients?



In the Resource Kit you will find a DVD entitled **From Hatchery to Home** produced by the **Australian Chicken Meat Federation Inc. AFTER** viewing the DVD write your responses to the following.

Poultry

Selective Breeding of Chicken Meat

In the Australian meat chicken industry, the great-grandparents of the birds that we eat are imported from overseas as fertile eggs. The birds that hatch from these eggs in quarantine have been selectively bred for desirable characteristics. They go out on to farms in Australia and produce eggs from which hatch the grandparent generation, which, in turn, produce the parent generation of the birds that end up on our tables.

Visit <u>www.chicken.org.au/page.php?id=5</u> on the Australian Chicken Meat Federation website.

1. List desirable characteristics for meat chickens.

- **2.** What advantage does the Australian chicken meat industry gain by importing greatgrandparent eggs from overseas?
- **3.** Why are the imported eggs hatched inside a quarantine facility? Give some examples of precautions taken to maintain health and hygiene in a quarantine facility.

4. How old are the great-grandparent birds when they are released from quarantine?

- 5. Explain the statement: "Each importation may have three or four separate genetic lines."
- 6. Where are the eggs from great-grandparent birds hatched?
- **7.** Grandparent flocks that come from the eggs of great-grandparents then produce fertile eggs from which the parent birds hatch. There is some crossing of breeding lines in this generation why?



What Does Selective Breeding Achieve?

Selective breeding plays a large part in the efficiency with which meat chickens convert feed to meat, and are able to attain their market weight quickly.

Visit <u>www.chicken.org.au/page.php?id=6</u> on the ACMF website to answer the following.

- **8.** The genetics of the chicken is the major determining factor in chickens' growth rate and size at the time they are harvested. Identify four other factors.
- **9.** Over the past 50 years there have been considerable improvements in chicken growth rates. What proportion of this is attributed to improved breeds?
- **10.** Outline some of the specific knowledge that has come from research into the nutritional requirements of meat chicken breeds.
- **11.** Why has it been possible to make much larger genetic gains in meat chicken breeds over the past 50 years compared to other larger livestock such as cattle?

Further Research on Selective Breeding

Selective breeding is used in most livestock farming. One industry that is benefiting from selective breeding research and techniques is Tasmania's \$170 million Atlantic Salmon industry. The CSIRO in partnership with a company (Saltas) is undertaking selective breeding work to improve salmon bloodlines.

Use this CSIRO webpage <u>www.csiro.com.au/science/ps25f.html</u>, and any other information sources you can find to research this project, or another similar selective breeding program used in Australian livestock farming. Prepare a report, outlining the selective breeding program, how it is being implemented and monitored, and which characteristics are being targeted; who is funding it, and who benefits from the program.

Present your report as a written, verbal, audio, visual or multimedia presentation.





In the Resource Kit you will find a DVD entitled **From Hatchery to Home** produced by the **Australian Chicken Meat Federation Inc. AFTER** viewing the DVD write your responses to the following. Poultry

Nutrition for Meat Chickens

Visit <u>www.chicken.org.au/page.php?id=6</u> on the ACMF website to answer the following.

- **1.** Identify 5 different nutrients (not feed ingredients) required by a growing meat chicken.
- **2.** The dietary formulation for chickens varies. How is the optimum and most economical combination of feed ingredients determined?
- **3.** Use the DVD or website to explain why feed prepared for meat chickens differs from that prepared for breeder chickens?
- **4.** Approximately what percentage of the cost of producing a live meat chicken is represented by feed?

5. From which feed ingredients do meat chickens gain their energy?

6. From which ingredients to they gain their protein?

- 7. What are lysine and methionine, and why are they added to the diets of meat chickens?
- **8.** Construct a pie chart showing the various percentages of the ingredients present in the feed of a typical meat chicken.

9. In what form is feed given to:

a) baby chicks?

b) chickens approaching their harvesting weight?

10. How is the feed prepared and made into the form in which it is given to chickens?

11. What is the purpose of preparing it at such high temperatures?





In the Resource Kit you will find a DVD entitled **From Hatchery to Home** produced by the **Australian Chicken Meat Federation Inc. AFTER** viewing the DVD use the table and graphs for Australian chicken meat production and consumption to write your responses to the following.

Production and Consumption

1. Describe the general pattern of chicken production in Australia over the 40 year period

between 1965/66 and 2005/06.

- 2. Was there any time during those 40 years that chicken production decreased from one year to the next? If so, when was it? _____
- **3.** Between the 1960s and the early part of the 21st century, why do you think the amount of chicken meat produced in tonnes has proportionally increased at a much higher rate than the number of birds produced?
- **4.** From what you learnt watching the 'From Home to Hatchery' DVD, suggest some reasons why the production of chicken meat has shown the trends that it has.
- 5. Describe the general trend in per capita chicken meat consumption between 1945 and 1963.
- 6. What has been the trend in Australian chicken meat consumption since 1964?
- 7. Compare the general patterns of consumption of chicken meat with that of beef and veal, lamb and mutton and pig meat between 1945 and 2005/06.

8. Which of the meat types shown has displayed:

- a) the greatest increase? _____
- b) the most consistent trend?
- c) the smallest increase (or largest decrease)?_____

9. Taking the consumption figures for all the types of meat shown in the following years: 1960, 1970, 1980, 1990, 2000 and 2010, prepare pie charts showing the relative percentages of the per capita consumption of chicken meat, beef and veal, lamb and mutton, and pig meat in Australia.





AUSTRALIAN CHICKEN MEAT FEDERATION INC.

In the Resource Kit you will find a DVD entitled **From Hatchery to Home** produced by the **Australian Chicken Meat Federation Inc.**

AFTER viewing the DVD use the table and graphs for Australian chicken meat production and consumption and any other research to complete the following task. Work in pairs or small groups.

Food Promotion

Prepare an advertisement promoting chicken meat as a popular and healthy food choice for one of the following media:

- a) a full page in a newspaper or magazine
- b) a 60 second spot on radio
- c) a 60 second spot on television
- d) a pop-up page on a relevant website

Your advertisement could include the following:

- reference (backed up with figures and/or graphs) to the increase in popularity of chicken meat among Australian consumers in recent decades
- reference to the fact that chicken is a convenient, nutritious and healthy food choice with many options for the way it is prepared and served
- reference to the fact that no hormones are fed to meat chickens; rather that their size and quality of meat results from selective breeding programs
- reference to the fact that meat chickens are not kept in cages at any stage, and that close attention is paid to their health and wellbeing

In undertaking this exercise, you need to do the following:

- carefully plan your advertisement and document all the planning stages
- prepare drafts for review by peers/teachers
- complete a finished version ie, all artwork for a print media or website ad; sound recording for a radio ad; vision and sound for a TV ad





In the Resource Kit you will find a DVD entitled **From Hatchery to Home** produced by the **Australian Chicken Meat Federation Inc. WHILE** viewing the DVD write your responses to the following.

Technology in the Chicken Meat Industry

Note down every point at which you notice evidence of technology being applied to farming and processing, and a brief description of what it involves (ie, a few words or a sentence). You may find it useful to make your notes under these headings:

- Breeding and Breeder Farms ______
- Hatcheries
- Feed Mills ______
- Rearing Farms ______
- Processing ______

Compare your lists with other students in the class. Design a poster or montage for display in the classroom that leads off with the words – **Technology in the chicken meat industry is found in:...** Then, with a combination of images and text, include all the points covered by the class about where technology is applied to chicken meat farming and processing.

Selective breeding over a number of decades has resulted in chickens that are very efficient at converting feed into meat, and which grow quickly to market size. Selective breeding is different from genetic modification. There are no genetically modified chickens in Australia.

- Explain how selective breeding and genetic modification are different. A visit to the webpage www.nerc.ac.uk/research/issues/geneticmodification/selective.asp from the National Environment Research Council in the UK will be of assistance:
- 2. Visit this webpage <u>www.chicken.org.au/page.php?id=8</u> on the Australian Chicken Meat Federation website. Look at the graphs that show a) the relative price of meats in Australia since 1970, and b) the consumption of various meats in Australia since 1945.

a) Describe the trend in the price of chicken in Australia compared with the other meats shown.



b) Describe the trend in the consumption of chicken in Australia compared with the other meats shown.

c) Read through the information under the headings 'Growth Rates' and 'Feed' on this ACMF webpage <u>www.chicken.org.au/page.php?id=6</u>. Write an extended response (150 - 200 words) on how research and technology have enabled the trends in chicken meat pricing and consumption to follow the patterns they have.



- 3. Visit this webpage <u>www.chicken.org.au/page.php?id=26</u> on the ACMF website:
 - a) What does CRC stand for?
 - b) Describe the make-up of the Poultry CRC.
 - c) What are the objectives of the Poultry CRC?
- **4.** Now visit the Poultry CRC website <u>www.poultrycrc.com.au</u>. Search for information relating to **research programs**.

a) Outline two research programs currently being undertaken by the Poultry CRC, and provide a one-sentence description of each.



b) The need for sustainability in the industry is often mentioned. What does sustainability mean? How might it directly relate to the chicken meat industry?

c) Take two examples of Poultry CRC programs (accessed via the above weblink), and briefly outline how each one focuses on sustainability in one or more aspects of the chicken meat industry.

d) Use the <u>www.poultrycrc.com.au</u> website to research what, in the view of the Poultry CRC, is identified as a major challenge facing the chicken meat industry. Outline the challenge.

Food Preparation



Time to Cook with CHICKEN!

Hawaiian Chicken

Ingredients

1 chicken	1 onion, sliced
¹ ⁄ ₂ cup celery	¹ / ₂ cup carrot
1 cup pineapple	1 capsicum
1 can cream of chicken soup	Almonds or cashews
¹ ⁄ ₄ cup cream	Salt & Pepper

Method

Boil chicken day before. Cut in pieces. Saute onion, celery, carrot and capsicum. Add pineapple and almonds, soup, chicken and cream last. Salt and pepper to taste. Simmer till hot. Serve with rice.

Apricot Chicken

Ingredients

6-8 pieces chicken	1 tin 440g apricot nectar
2 bacon rashers	1 creamy onion soup
2 sticks celery	1 tablespoon cornflour
2 carrots	

Method

Place chicken, bacon rashers, celery stick and carrots in an ovenproof dish. Put apricot nectar, onion soup and cornflour together and pour over top of other ingredients. Cook 2 hours in a moderate oven.

Source: Hart, J. Party Time at Riverview, Recipe Book, Toowoomba Education Centre, Toowoomba.

There are many more chicken recipes to be found at

http://www.chicken.org.au/page.php?id=11



Time to Cook with CHICKEN!

Lemon Chicken Ingredients

1 ¹ ⁄ ₂ teaspoons paprika	1 ¹ / ₂ teaspoons salt
¹ ⁄4 teaspoon black pepper	2 tablespoons oil
6-8 Chicken pieces	¹ / ₂ cup lemon juice
2 tablespoons grated rind	1 clove garlic
2 teaspoons soy sauce	2 teaspoons brown sugar

Method

Mix paprika, salt and pepper. Rub over chicken pieces. Heat oil in pan and fry chicken until

golden brown. Mix remaining ingredients and pour over chicken.

Source: Hart, J. Party Time at Riverview, Recipe Book, Toowoomba Education Centre, Toowoomba. Sweet and Sour Chicken (Serves 4)

Sweet and Sour Chicken

Ingredients

- 500g skinless, boneless chicken breast fillets, diced
- 2 tablespoons vegetable oil
- 1/2 green capsicum, sliced
- 1/2 red capsicum, sliced
- 2 carrots, cut into long, thin slices
- 1 clove garlic, finely chopped
- 1 tablespoon cornflour
- 4 tablespoons soy sauce
- 225g can pineapple pieces, juice reserved
- 1 tablespoon rice vinegar
- 1 tablespoon soft brown sugar
- 1/2 teaspoon ground ginger

Preparation Method 10 mins | Cook: 10 mins

1. Heat oil in a large wok over medium high heat and brown chicken. Add green and red capsicum, carrot and garlic and stir-fry for 1 to 2 minutes.

2. In a small bowl, mix together the cornflour and soy sauce. Add to wok along with the pineapple and juice, vinegar, sugar and ginger. Stir together and bring to a boil. Serve over rice.



Research and Experiments



Research Topics

Welfare issues relating to production can often be a 'hot topic' amongst consumers and the media. As a consumer we should all make INFORMED decisions.

The following topics often provoke thought and discussion. The students could complete the research using the following ideas:

- 1. Groups could present the advantages and disadvantages of their topic in a written format, poster and/or presentation.
- 2. Debate the topics with the aim of convincing the audience that their topic is the most suitable production method: *they could relate this to any aspect eg, animal welfare, financial return, etc.*

Topics

- 1. Choose one of the following methods of housing laying chickens. Investigate the advantages and disadvantages. Present your findings as a written report.
 - Barn
 - Free-range
 - Cage
- 2. Prepare a PowerPoint or Keynote presentation on the advantages and disadvantages of intensive production such as caged housing verses extensive production such as free-range housing.
- 3. Debate the topic "That organic feeding of chickens has no real benefits over conventional feeding."
- 4. Prepare a two page report on the development and changes that have taken place in the chicken meat industry or the egg industry over the last fifty years. Special emphasis should be given to the welfare of chickens.
- 5. Prepare a PowerPoint or Keynote presentation on the people that work in the chicken industry. Be sure to include the ways these workers are involved in the welfare of chickens.
- 6. Prepare a discussion of the issues involved in the location of egg farms close to urban areas.
- 7. Debate the topic "That egg production is harmful to the environment."
- 8. Prepare a PowerPoint or Keynote presentation on avian influenza (bird flu). Include the causes, the human risks and the research and management practices used to combat this disease.
- 9. Prepare a report on the biosecurity measures undertaken by egg producers to limit the spread of infectious diseases and pests.



Examples of Experiments for Schools

- 1. Different levels of the amino acid lysine in the feed of broiler birds. One diet optimal, one sub-optimal and compare the growth rates of the two groups of birds.
- 2. Different levels of a mineral such as zinc in feed. One diet would contain 20-30 ppm which is the normal requirement, the other diet would have a level of 10 ppm and birds will not grow properly on this level of Zn.
- 3. For laying hens, different levels of yolk pigment can be added to feed and the yolk colour of the eggs compared.
- 4. Broiler chicks can be fed feeds based on barley, one without an enzyme and the other with enzyme added, and the growth rates of the birds compared.
- 5. Diets for broiler birds could be formulated based on different feed ingredients and/or different levels of protein.
- 6. For layer birds, production and egg quality could be compared for different types of housing e.g. cages versus barn or free range.
- 7. Comparison between broiler and layer birds fed the same diet (ACMF Project)
- 8. Behavioural studies such as raising birds in cages and then keeping one group in cages and placing the other group into floor pens. Then score the range and frequency of bird behaviours.
- 9. Compare the behaviour of birds that have been handled regularly and are used to humans and a group that has not been handled regularly, when they are exposed to new situations involving people.
- 10. Obtain eggs from a supermarket. Keep half of the eggs in the refrigerator and leave the other half out at room temperature. Then test the eggs from the two groups for albumen quality (albumen height and calculate Haugh Units).
- 11. Compare production performance of different breeds of laying bird.
- 12. For laying birds, use different lighting programs e.g. different hours of daylight and see what effects this has on production.
- 13. Incubate fertile eggs and candle the embryonated eggs at different ages to observe the rate of development.
- 14. Make up a diet and feed some of it in mash form and some in pelleted form to birds and see what effect it has on feed intake and growth rate.
- 15. Investigate the relationship between the body weight of newly hatched broiler birds and the rate of growth and weight at different ages.



Experiment: Body Weight

Investigate the relationship between the body weight of newly hatched broiler birds and the rate of growth and weight at different ages.

Material:

- Heat lamps (infra-red heat lamp, 150 watt external spot-light or an incandescent globe is suitable)
- Draught excluder and insulation material (if required)
- Litter
- Feeders
- Waterers
- Ration
- Day-old broiler birds
- Scales
- Measuring tape
- Identification tags

Method:

- 1. Prepare area for rearing chickens
 - a. Ensure area is clean and disinfected
 - b. Set up area with plastic sheeting on the ground and draught excluder around the edges of the plastic sheeting (can use hay bales, cardboard, etc.)
 - c. Lay litter
 - d. Place in feeders and waterers
 - e. Connect heat lamps to power chicks should be kept at 33° C for the first week, then reduce by 0.5 °C per day to about 24 °C in the fifth week.
- 2. Place day old chicks in rearing area
- 3. Ensure the chicks food and water is fresh and checked daily

Recordings: These are only ideas...

Weight and growth records

Chick ID	Weight (g)	Height (cm)	Sex	Age	Comments

Feed and water records

Date	Day	Feed (kg)	Water (l)



Writing Laboratory Reports

All laboratory reports follow a standard format. The basic purpose of laboratory reports is to record your findings accurately and describe their significance. A laboratory report is more than simply a copy of the results from your experimental work. You need to demonstrate how well you understand the concepts that underpin both the experiment and the data you generate. In order to convey your understanding convincingly, you will need to write clearly and order your thoughts in a logical way throughout the report.

Step 1: WHAT do you need to know in order to understand this experiment?

Research your topic! Most laboratory reports require an explanation of the background concepts involved in the experiment. Asking yourself questions about the purpose of the experiment before it starts will help you establish what it is you need to know from the experiment.

- What is the aim?
- Why is it important to explore this topic?
- How is this topic related to the other concepts you are examining in the unit?

Step 2: WHY you are doing this experiment?

Research the scientific principle you are trying to demonstrate through the experiment. Read the relevant material beforehand to establish what you will be doing and what results to expect (in a general sense) and why. Write a paragraph or two answering the following question:

• What scientific principles will this experiment help you explore?

Step 3: HOW are you going to do this experiment?

Determine the sequence of tasks you will perform and what instruments and materials you will be using. Make sure you are clear about:

- The order in which each task should be done
- Whether you need to start some tasks while other tasks are continuing
- Whether you are working alone, in pairs or in groups
- What the instruments are and what they do

Knowing how you will complete the experiment will make it easier to write about the process in the report. Also, these factors can have an impact on your results, so it is worthwhile keeping track of them.

Step 4: Create the format for your report

The following format is a guide or template.

Basic Format of a Lab Report

Title Page: Must have title of experiment & names of people in your group. Title should be short while reflecting the exact nature of the experimental study.

Abstract: Summarise in one short paragraph the reason for the study, the methodology, the results that were obtained and the conclusions that you reached.



Introduction: Explain why this study was carried out (i.e. what were you trying to explore or prove?). Summarise the relevant background information that explains existing theories or knowledge about this experiment. Finally, state your scientific objective, i.e. the hypothesis you are addressing.

Materials and Methods: List the materials used and describe *exactly* how the experiment was conducted. Be sure to use correct referencing! (both in-text and end of text referencing). Always write your methodology in the past tense.

Results: Summarise your observations and the data of the experiment *without* interpreting them, i.e. no comments about why you got the results you did. It is extremely useful to present your data using tables and figures (graphs, photos, illustrations are all figures); however, you must also include a description of your findings. This can be as simple as a few sentences *and* must appear *before* the table or figure it refers to. Concentrate on the overall trends in your data, not every single detail. Always write your results in the past tense.

Reminder!

All tables and figures must have a title and number. You must use this number when describing your findings. For example, "There was a 30% increase in the rate of heating (Fig.1)." Make sure the axes on any graphs are labeled correctly and include the appropriate units of measurement.

Discussion: Discuss the experiment by interpreting your data, explaining what your outcome means and how your results relate to the background theory already mentioned in your Introduction. A very good way to begin your discussion is with a sentence that describes your most significant results. This is also the section to discuss factors which may have influenced your results (did everything go according to plan? If not, how did it affect your results?). It may be necessary to offer possible reasons why your results did not match those of similar experiments. Where appropriate, *reference* information.

Your discussion needs to let your reader know what can be concluded from your results. Write in the present tense.

Conclusion: Provide a statement or two about what you can accurately conclude from the results you obtained.

References: Include all material you have used to help you write this laboratory report. Ensure that you use the recommended referencing style

Appendix: Include raw data here if appropriate; this might include sample calculations.

Tip! Write the abstract last – when you know exactly what you did and what you achieved. A template is provided on the next page.



Experiment Proforma		
Student Name:		Class:
Teacher Name:		Date:
Experiment Title:		
Group Members:		
Aim:		
Hypothesis:		
Materials:		
Methods:		



Results:

Conclusion:

References:

Appendix:

Teacher Help





Anatomy of a Chicken Answers



Definitions in Health Management Answers

Disease	Where the body, or some organ or part, is unable to perform its normal function
Agent of disease	The carrier or cause of disease
Infectious agents	Those that are capable of spreading a disease from one plant or animal to another
Contagious disease	Also read 'infectious' disease. One that is able to be transmitted from one animal to another.
Infective organism	An organism that can produce or transfer infection
Host	The organism that parasites obtain nutrition from
Pathogen	An organism that can cause disease
Parasite	An organism that lives on or in another organism (the host) and from which it obtains nutriment.
Vector	The way in which a pathogen moves from one organism to another
Intermediate host	An organism that the pathogen lives on or in for part of its life cycle, before spreading to the host for a later stage of its life cycle
Endemic	Found regularly among a particular population or in a particular area
Notifiable diseases	A disease that must be reported to a district veterinarian or ranger employed by the Rural Lands Protection Board for the district in which the stock are located, or a NSW DPI veterinarian within 48 hours of suspicion or confirmation of the disease, or in the case of exotic disease, as soon as expected.
Biosecurity	the protection of people, animals and ecological systems against disease and other biological threats. Biosecurity is achieved through systems that aim to protect public health, animal and plant industries, and the environment, from the entry, establishment and spread of unwanted pests and diseases.

References: Introduction to Animal Health Risk Management Participant Handbook, Animal Health Australia, 2007. pp 10 - 15



The Structure of an egg: ANSWER SHEET





Egg components

What percentage of the total egg weight is yolk? 31%

The yolk consists of 51% percent water, 30.5% percent fat, 316% percent protein.

What other nutritional elements are found in the yolk? Vitamins and minerals

The colour of the yolk is determined by the hen's diet.

A round white spot called the germinal disc can be seen on the surface of the Yolk. In fertile eggs this is where the chick starts to develop.

In eggs produced for human consumption, what happens to the germinal disc? It remains as a small white spot.

What is the purpose of the vitelline membrane? It holds the yolk toether.

What is the purpose of the chalaza? They anchor the yolk in the centre of the egg.

The albumen is 58% of the egg. It consists of 88% water and 9% protein.

What is the purpose of the albumen? The thick albumen around the yolk acts as a cushion for the yolk.

What role does the shell membrane play? It prevents bacteria from entering the egg.

What role does the shell play? The shell protects the contents of the egg but allows gas and water to pass through thousands of tiny pores.

The shell makes up 11% of the weight of an egg. About 98% of the shell is Calcium carbonate. The other main elements found in the shell are magnesium and

phosphorus.

How does the air cell form in an egg? After the egg is laid the egg cools and the inner shell membrane pulls away from the outer shell membrane at the blunt end of the egg to form a cell of air.





ANSWER SHEET: It all starts with an Egg

- 1. How do eggs help us? Eggs make us strong, smart and healthy
- 2. Where are eggs produced?
 - a. Barn
 - b. Cage
 - c. Free-range
- 3. How many eggs do Australians eat every year? Over 3.5 billion eggs a year
- 4. What are the benefits of chickens being in cages?

The chickens are safe, clean and healthy. The farmer can keep their feed, air, water and temperature controlled. The cages also keep the chickens away from predators such as foxes and eagles.

5. What are the benefits of chickens being in barns?

The chickens can move through the shed and scratch and they have a lot of perch areas to enjoy.

6. What are the benefits of chickens being free-range?

The chickens lay eggs and sleep inside the shed. They can wander outside and pick the ground when they like. They can also scratch around but they need to be careful of predators.

7. What types of ingredients are in chicken feed? Wheat, sorghum, limestone, vitamins and minerals.

8. What does a veterinarian do?

A veterinarian keeps the animals healthy and without disease. They also treat sick animals.

- 9. When visiting a farm how do you stop disease from spreading?
 - Clean cars and trucks
 - Wear overalls
 - Wash your hands
 - Wear shoe covers
- 10. How long does it take chickens to hatch? 21 days
- 11. How old is a chicken when it first lays an egg? 4 months
- 12. How often does a chicken lay an egg? Once a day or six times a week





In the Resource Kit you will find a DVD entitled **From Hatchery to Home** produced by the **Australian Chicken Meat Federation Inc.**

Their website is **www.chicken.org.au**.

Background for Teachers

The activities provided in the Chicken Meat section of the Poultry Industry Teaching Resource folder are designed for students in years 7 to 10. Students are directed to web pages on the Australian Chicken Meat Federation website for information relating to these activities. Depending on the ability level of students, modification of the language used in questions and instructions may need to be made. They can also be used on a selective basis for studies at senior level in Biology, Agricultural Science and Economics.

The first activity should be done BEFORE the students watch the DVD. It should provide the teacher with an overview of the level of awareness the students have of the chicken meat industry. The next activity should be done while the students watch the DVD. They may have to work in groups and the DVD may have to be stopped from time to time. The activity should provide the students with facts and figures and an overview of the chicken meat industry. Answers are provided for this activity in this section of the folder.

The focus of the next activity is selective breeding in the chicken meat industry, covering areas including characteristics meat chickens are selectively bred for, economic and other benefits to the industry, and the impact selective breeding has had over the past 50 years. Selective breeding is different from genetic modification. There are no genetically modified chickens in Australia.

The fourth activity focuses on chicken nutrition and the ingredients in chicken feed, highlighting the impact that research and technology has had in this area on the chicken meat industry in Australia.

The production and consumption activity requires students to analyse the tables and graphs provided that show trends in chicken meat production and consumption since around the middle of the 20th century. A number of the questions require students to examine various aspects of the data and comment on trends.

The food promotion activity requires students to work collectively to undertake the planning and production of an advertisement (print, broadcast or web-based) that promotes chicken meat. Their work should be factually based, but provides the opportunity for students to use a range of creative and other skills in the production of their promotional piece.

The technology activity requires viewing of the 'From Hatchery to Home' DVD. Students are asked to note down every point in the farming and processing of meat chickens where there is evidence of the application of technology. Using the collective information from the class, they can then make a display for the classroom. This activity might be particularly suitable for a lower level ICT class. Students are directed to the Australian Chicken Meat Federation website. Some of this information is also used in the activities relating to Selective Breeding and Nutrition. There are also questions on on-going research and development in the industry, and the work of the Poultry Cooperative Research Centre (CRC). Particular emphasis is placed here on working towards, and improving, sustainability in the industry.

In the biosecurity activity the focus is on the maintenance and monitoring of flock health on meat chicken farms and breeder farms. Areas covered include various biosecurity measures employed on breeder and meat chicken rearing farms, the economic and regulatory imperatives relating to biosecurity, and the safe use of antibiotics.

The major activity on biosecurity requires students to use the information from the web page referred to in order to devise a biosecurity plan that covers both everyday operations and responses to emergency situations in one of three areas – farm facilities; personnel; or operations. The second part of this activity covers the use of antibiotics in meat chicken farming, and directs students to the ACMF antibiotic policy. A range of questions are asked relating to various aspects of this policy document. Finally, students are asked to research and report on Avian Influenza, how it is carried and transmitted and its impact on birds and people in areas where it has been identified. They also assess the situation in Australia regarding Avian Influenza and the measures in place to prevent its occurrence here.

The final activity focuses on the care and welfare of chickens on farms. The first part of this activity looks at living conditions on breeder and meat chicken rearing farms. Students are asked to diagrammatically represent a typical large-scale meat chicken shed, and list various types of equipment used to maintain flock wellbeing and comfort. This can be undertaken with information from the DVD 'From Hatchery to Home'. Students are also directed to the ACMF website where a summary of the industry's approach to animal welfare is presented. From here, they are asked to download the Code of Practice relating to poultry farming, and are guided through various sections of it via a series of questions.

A glossary of terms used in the chicken meat industry, the DVD and the ACMF website is also provided in this section of the folder.

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AUSTRALIAN CHICKEN MEAT FEDERATION INC. In the Resource Kit you will find a DVD entitled **From Hatchery to Home** produced by the **Australian Chicken Meat Federation Inc. WHILE** viewing the DVD write your responses to the following.

Introduction to the Chicken Meat Industry

- **1.** How many kilograms of chicken does the average Australian eat in one year? **36** kg.
- 2. What was the equivalent figure back in 1965? 5.9 kg.
- **3.** Around 470 million meat chickens are processed in a year by the Australian chicken meat industry. What is the estimated weight of chicken meat produced from this many chickens? 770000 tonnes.
- **4.** Complete this table:

Approximate gross value of chicken meat production per year.	\$1.4 billion
Estimated retail value of chicken meat industry per year.	\$4.4 billion
Number of jobs supported by the chicken meat industry.	40000

5. Complete the sentence:

a) Meat chickens are sometimes called broilers. They are very different from the

chickens bred to produce eggs.

b) Regarding this last statement, in what ways are they different? They are different breeds. They look different, they grow differently, and different methods are used to house and grow them.

6. What is meant by the statement that 'the chicken meat industry is highly vertically integrated'? It means that larger meat chicken companies tend to own and operate all the various stages involved in meat chicken production, including breeding and hatching farms, rearing farms, feed mills and processing plants.

Breeding and Breeder Farms

- **7.** How do the great-grandparents of the chickens that we eat in Australia arrive into the country? They arrive as fertile eggs.
- 8. State how many birds of each generation great-grandparents, grandparents and parents of meat chickens grown for human consumption might typically be out on the farms in Australia at any one time. Great-grandparents: up to 25000, Grandparents: up to 250000, parents: up to 6 million
- **9.** How long are the parents of meat chickens kept? 52+ weeks. Approximately how many fertile eggs are collected from them in this time? About 160
- **10.** The breeder flocks are kept in large sheds and are raised on the floor. What is the floor covered with? Wood shavings or rice hulls
- **11.** Breeder flocks are kept in sheds with nest boxes when they reach maturity at about 20 weeks of age. Why are they kept here, and why are males and females kept together?



They start laying eggs in the nest boxes at this age. Males and females are kept together to ensure the eggs are fertile.

12. Why is the feed for breeder chickens different from that given to those birds raised for meat consumption? Breeder chickens have different nutritional requirements to meat chickens. For example, their feed is lower in protein to satisfy the requirements for egg production vs growth. It contains higher levels of certain vitamins and trace minerals, which impact on the hatchability of their eggs, and more calcium, which is needed for egg shell formation. It is also lower in energy content, to help manage their growth rate, so birds do not get overweight, as excess body fat can affect egg production.

Hatcheries

- **13.** Why might fertile eggs be fumigated before being incubated? Eggs may be fumigated to kill any harmful bacteria or viruses on the egg shell.
- **14.** Complete the sentence:

The two stages in the incubation process are called the setter stage and the hatcher stage.

- **15.** How many days are eggs incubated at each of these stages? 18 days in the setter stage, 3 days in the hatcher stage
- **16.** What is the purpose of grading the chicks after they hatch? The chicks are graded to remove any unhealthy ones.
- **17.** What does the term hatchability mean? It refers to the number of live chicks hatched as a percentage of the number of fertile eggs that were set for incubation.
- **18.** Identify four factors that can affect hatchability.

1. the health, age, nutrition and fertility of breeder flocks – (as the birds get older, hatchability decreases);

- 2. how well the incubation conditions have met the embryo's needs;
- 3. hygiene practices in the hatchery; and
- 4. how the eggs have been handled since they were laid.

Feed Mills and Rearing Farms

- **19.** What happens at a feed mill? At a feed mill, grains and other ingredients are combined to produce feed for meat chickens.
- **20.** What role do poultry nutritionists play? Poultry nutritionists formulate the diets and work with the feed mill manager to ensure that feeds are produced to strict nutritional and quality standards.
- **21.** Identify the two grains that make up around 60 per cent of meat chickens' feed.

The grains that make up the majority of feed are wheat and sorghum.

22. Other than grains, what else is in the feed? Other than grains, feed is made up of protein meals, such as soymeal and canola meal, fats and oils, vitamins, minerals and amino acids.



23. Complete the sentence:

In producing breeder chickens and meat chickens, no hormone supplements are used in

Australia – the practice was banned over 40 years ago.

24. Complete the sentences:

Chickens that are raised for meat consumption are never kept in cages. They live on the floors

of large chicken sheds, which are covered with comfortable bedding material.

25. What could the dimensions of a typical meat chicken rearing farm shed be?

Up to 150 metres long and 15 metres wide.

26. Up to how many day-old chicks could be housed in one of these sheds?

45 000 day-old chicks.

27. What does brooding mean?

Brooding means heating the sheds to provide the newly hatched chicks with warmer and more uniform temperatures than can normally be provided outside.

28. Describe how the temperature inside the chicken sheds is controlled.

Temperature sensors throughout the poultry shed monitor temperatures carefully and allow the ventilation (fans), heating and cooling systems to be automatically adjusted, frequently, to keep temperatures within optimal ranges.

29. Why are all meat chicken farmers required to have biosecurity practices in place?

Farmers are required to have biosecurity measures in place, in order to prevent the spread of disease and infection.

30. When might flocks be treated with an antibiotic?

Flocks might be treated with antibiotic if they succumb to a bacterial infection, or are in danger of doing so.

31. What measures do farmers use to prevent disease or infection?

Measures include a) vaccination, b) farm hygiene, c) precautions such as requirements for visitors and others to wear overalls and boots provided by the farmer on the property, or disinfecting footwear in foot baths at the entrance to sheds, d) and keeping wild birds and their droppings – which can also carry disease – away from meat chickens.

Processing Ready For Consumption

- 32. At what age are meat chickens ready for processing? Around six or seven weeks old.
- **33.** How do chickens get from the farm to the processing plant? They are picked up on the growing farm, usually manually, by pick-up crews, and are placed in transport crates or modules, which are loaded on to trucks and taken directly to the processing plant.
- **34.** Identify four steps taken after live birds arrive at a processing plant. After live birds arrive at the processing plant, they are unloaded, stunned unconscious so that they do not feel pain or stress, before being humanely killed. They are then taken to a defeathering room where they



are plucked and parts of the chicken that aren't eaten are removed. They are then cleaned, cooled, inspected for quality, graded by size, cut up, filleted, packaged, chilled or frozen and distributed.

35. Fill in the missing numbers:

The largest chicken meat processing plant processes 700000 birds per week, and employs 720 people.

- **36.** What does HACCP stand for, and what is the purpose of HACCP? HACCP stands for Hazard Analysis and Critical Control Points. HACCP is a strictly monitored food quality program to manage food safety risks.
- **37.** What should you look for to ensure chicken has been adequately cooked?

To ensure a chicken is adequately cooked, look to see that the juices run clear, and that the meat does not appear pink.

38. Identify four factors that have led to the price of chicken not increasing as much as the prices of other meats over recent decades.

(1) a range of research and technological advancements – (eg increased automation);

(2) improvements in the rate at which chickens grow and convert feed into meat;

(3) raising birds on breeder and meat chicken rearing farms is more efficient due to better knowledge of their nutritional and housing requirements; and

- (4) more effective strategies to maintain bird health.
- **39.** Chicken meat is a good source of which dietary nutrients? Chicken meat is a particularly good source of protein, B Vitamins, zinc and magnesium and a good source of iron and Vitamin E.





In the Resource Kit you will find a DVD entitled **From Hatchery to Home** produced by the **Australian Chicken Meat Federation Inc.**

The table below refers to meat consumption in Australia.

YEAR	BEEF & VEAL	LAMB &	PIG MEAT	POULTRY	CHICKEN
	kg/person	MUTTON kg/person	kg/person	MEAT kg/person	MEAT kg/person
1945	42.3	33.6	8.2	4.9	4.6
1946	43.8	30.7	6.9	4.9	4.6
1947	49.4	31.6	8.6	4.9	4.6
1948	55.0	33.2	8.1	4.4	4.2
1949	56.4	33.1	7.7	4.4	4.2
1950	59.7	28.6	6.9	4.4	4.2
1951	53.9	29.5	6.6	4.4	4.2
1952	54.3	35.6	5.9	4.4	4.2
1953	52.0	35.5	6.8	4.4	4.2
1954	52.8	35.4	8.2	4.4	4.2
1955	54.0	34.2	7.8	4.4	4.2
1956	58.5	33.8	7.0	4.4	4.2
1957	56.7	35.9	8.1	4.4	4.2
1958	53.3	62.5	8.2	4.4	4.2
1959	44.6	46.6	7.9	4.4	4.2
1960	38.7	46.0	8.3	4.4	4.2
1961	42.4	44.5	9.4	4.4	4.2
1962	45.3	42.4	8.8	4.4	4.2
1963	47.5	40.6	8.5	4.4	4.2
1964	45.0	38.6	8.8	5.2	4.9
1965	42.0	37.6	9.5	6.2	5.9
1966	38.6	38.0	9.8	7.4	7.0
1967	40.7	38.5	10.1	8.4	7.9
1968	41.3	40.7	10.8	9.0	8.5
1969	38.6	37.5	11.3	10.5	9.9
1970	39.2	48.6	13.5	10.4	9.8
1971	41.3	53.2	13.1	12.2	11.5
1972	39.7	49.1	14.2	12.2	11.5
1973	46.0	30.0	15.6	12.5	11.8
1974	53.0	25.3	12.6	14.4	13.6
1975	65.9	24.3	11.6	13.5	12.8
1976	68.7	20.6	10.3	14.8	14.0
1977	67.9	18.6	13.3	16.1	15.2
1978	65.0	16.8	13.8	17.5	16.5
1979	45.3	20.6	14.0	19.8	18.7
1980	45.1	20.0	15.5	21.0	19.8
1981	47.9	19.0	15.3	19.3	18.2
1982	49.7	21.2	14.8	19.3	18.2
1983	42.5	20.5	15.9	20.2	19.1
1984	44.8	22.1	16.4	20.9	19.8
1985	40.4	24.5	16.7	22.4	21.2
1986	41.5	22.5	17.0	23.2	21.9

Meat Consumption



1987	40.1	23.3	17.3	24.1	22.8
1988	40.2	21.4	17.7	24.7	23.3
1989	42.1	23.0	18.1	24.7	23.3
1990	39.3	21.3	18.4	24.9	23.5
1991	38.9	22.0	18.4	25.2	23.8
1992	36.8	21.2	19.4	25.7	24.3
1991/92	37.4	21.0	19.3	25.8	24.4
1992/93	36.5	19.9	18.4	26.5	25.0
1993/94	38.3	20.6	19.4	27.9	26.4
1994/95	36.8	18.8	19.4	27.2	25.7
1995/96	36.9	17.1	19.3	27.9	26.4
1996/97	40.4	17.4	18.9	28.3	26.7
1997/98	38.7	17.0	18.8	29.5	27.9
1998/99	37.0	16.8	19.7	30.6	28.9
1999/00	38.3	17.9	19.8	31.9	29.9
2000/01	33.9	18.1	18.0	32.5	30.7
2001/02	35.2	15.9	20.2	34.6	32.6
2002/03	37.1	14.7	21.0	35.1	33.1
2003/04	37.7	12.8	22.6	34.7	32.8
2004/05	37.0	12.7	22.1	37.7	32.8
2005/06	36.7	13.2	22.2	38.0	35.9
2006/07	36.8	13.6	22.2	38.3	36.2
2007/08	37.0	13.6	22.2	38.5	36.4
2008/09	37.3	13.7	22.2	38.5	36.4
2009/10	37.6	14.1	22.2	38.8	36.7
2010/11	37.8	14.1	22.3	39.0	36.9

Consumption of Various Meats







In the Resource Kit you will find a DVD entitled **From Hatchery to Home** produced by the **Australian Chicken Meat Federation Inc.**

The table below refers to chicken meat production in Australia.

Chicken Meat Production

YEAR	NUMBER OF BIRDS	CHICKEN MEAT PRODUCED
	(MILLION BIRDS)	(tonnes carcass weight)
1950/51	3.0	na
1960/61	20.0	na
1964/65	42.0	na
1965/66	52.6	57,857
1966/67	67.1	76,264
1967/68	76.4	89,518
1968/69	75.2	93,737
1969/70	84.6	105,431
1970/71	103.9	131,046
1971/72	113.3	141,700
1972/73	113.2	138,320
1973/74	139.8	171,268
1974/75	134.2	165,989
1975/76	144.2	183,907
1976/77	155.1	195,576
1977/78	174.7	220,489
1978/79	187.9	239,743
1979/80	222.5	281,910
1980/81	221.7	276,161
1981/82	205.9	259,463
1982/83	226.2	282,964
1983/84	216.2	272,023
1984/85	244.2	315,296
1985/86	258.3	333,777
1986/87	269.3	344,522
1987/88	273.6	362,289
1988/89	274.1	368,351
1989/90	285.5	379,852
1990/91	283.7	388,242
1991/92	293.5	415,569
1992/93	304.1	434,716
1993/94	329.5	468,722
1994/95	330.5	466,551
1995/96	336.4	480,544
1996/97	340.9	487,929
1997/98	364.2	543,804
1998/99	375.0	564,270
1999/00	394.0	597,680
2000/01	398.9	619,406
2001/02	415.6	667,471
2002/03	419.2	689,826
2003/04	420.1	683,534
2004/05	460*	748,440#
2005/06	474.5*	772,065#
2006/07	487.9*	

Sources: Australian Bureau of Statistics and Australian Bureau of Agricultural and Resource Economics



= ACMF estimate based on chicken meat consumption representing 94.5% of all poultry meat processed

• = ACMF estimate derived from estimated chicken meat production / average dressed weight of 1.627 kg/chicken.

Chicken Meat Production in Australia







In the Resource Kit you will find a DVD entitled **From Hatchery to Home** produced by the **Australian Chicken Meat Federation Inc.** A glossary of terms used in the DVD and their website <u>www.chicken.org.au</u> is provided in the table below.

Glossary

Term	Definition
Antibiotics	medicines used to treat bacterial infections in chickens.
Avian influenza	a bird disease, caused by a virus. Australia's poultry flocks are currently free of avian
	influenza, but have had five outbreaks in the past caused by various strains of theavian
	influenza virus, all of which were eradicated quickly.
Bird flu	the name given by many people to a special strain of avian influenza (the H5N1 strain)
	which has caused problems in birds in many countries since 2003, and which is
	occasionally caught by humans. This strain has never been in poultry in Australia.
Biosecurity	precautions taken on chicken farms to make sure chickens are not exposed to disease
210000001109	or germs.
Breeder chickens	chickens used to produce fertile eggs
Breeding companies	companies which specialize in breeding chickens with certain characteristics. These
Directing companies	companies are generally in the US and Europe
Breeding farm/Breeder	a farm where chickens are kent to produce fertile eggs. These eggs are hatched to
form	become the next generation of chickens
	become the next generation of emerchs.
Broiler	another word for a meat chicken hird
Brooding	the process by which young chicks are kept warmer with heaters in the shed
Droounig	the process by which young chicks are kept warner with heaters in the shed.
Cockerel	a male chicken, used for breeding as a parent, grandparent or great-grandparent of meat
	chickens: sometimes also called a rooster.
Drinkers	equipment which gives chickens access to drinking water.
Evaporative cooling	a form of cooling in a shed, where air entering a shed is cooled down by passing it
L'uporuité coomig	through moist panels
Feed mill	a facility which makes up chicken feed using mostly grains to make a nellet sized
	feed
Feeders	equipment which gives chickens access to their feed
Fertile eggs	eggs which have been fertilised by a cockerel and so are canable of producing a live
r crime eggs	chick (These are distinct from table eggs, which are not generally fertile and are used
	only for eating).
Fillet	a cut of chicken meat which does not contain bones.
Food safety	refers to keeping food free of bacterial and other contamination that could
1 oou bulety	harm consumers.
Free range	free-range chickens have access to an outside run, as well as to a shed or other shelter
The funge	nee range enterens have decess to an outside ran, as wen as to a shed of outer sherter.
Fumigation	gas treatment of eggs to kill any bacteria or other germs that might be on the outside of
i unigution	the egg.
Genetically modified (GM)	a breed of plant or animal that has been produced by deliberately selecting specific
Genetically mounted (Givi)	genes from one plant or animal to put into another. No chickens used in commercial
	chicken meat production in Australia have been genetically modified. All chickens in
	Australia have been bred using conventional selective breeding techniques. Some feed
	ingredients used to prepare chicken feed eg; sova beans, may have been produced from
	genetically modified crops. The use of GM feeds do not affect the composition of
	chicken meat in any way, there is no difference in the meat.
Grading	a stage in processing where chickens are sorted by size.
Grandparent	a bird used on a breeder farm to produce fertile eggs from which the parents of meat
	chickens will hatch.
Great-grandparents	birds which are the great-great-grandparents of the meat chickens raised for human
G 1	consumption. They are imported as fertile eggs that are hatched in Australia. They are
	grown to be used for breeding.
Growout farms	rearing farm: a farm which raises meat chickens from the age of one day until they
	are ready for processing.
Hatchability	the number of live chicks hatched as a percentage of the number of fertile eggs sent for
	incubation.
Hatcher	a machine which keeps eggs warm in the last three days of development, and houses

Poultry CRC



	the hatching chicks.
Hatchery	a facility which incubates fertile eggs that come from breeder farms until the chicks are
U	hatched from them.
Hen	a female chicken, used for breeding as a parent, grandparent or great-grandparent of
	meat chickens.
Hormones	naturally occurring substances that perform important biological functions in plants and animals. Hormones are not fed or otherwise administered to meat chickens.
Humane	humane treatment of birds and animals means treating them in a way that aims to
	minimise any pain or distress.
Incubation	keeping eggs in constantly warm conditions so that the chick embryo in the fertile egg
Intensive	intensive animal agriculture involves managing space carefully, often indoors, to house
	larger numbers of animals to increase productivity. Feed is usually prepared and
	brought to intensively reared animals.
Litter	the bedding on the floor of the sheds where meat chickens and breeders are kept.
Meat chicken	a bird raised to be eaten for meat. These birds are not used to produce table eggs.
Nest box	a place where breeder chickens instinctively lay their eggs because it provides them
	with some privacy.
Organic	certified organic chickens are given feed which is mostly made up from ingredients
	that are certified organic, that is, they have not had chemical pesticides or fertilizers
	used in their production. Like free range chickens they are not given antibiotics to treat disease, and they have access to an outside run, as well as to a shed or other the liter.
Daront	usease, and they have access to an outside run, as well as to a sned or other shelter.
rarem	a one used on a direction familie o produce fertile eggs from which meat chickens will hatch
Pick-un crew	a team of people who come into the chicken shed when the flock is ready for
rick-up crew	processing to pick up the chickens and put them in crates or modules which are
	transported to the processing plant
Plucker	a machine that removes feathers from a chicken carcass
Processing	all the steps involved in bringing chickens from the farm to the point of being
rocessing	packaged meat ready for distribution. While the precise steps depend upon the final
	product, this generally includes stunning and humanely killing the birds, removing the
	feathers and parts of the chicken that aren't generally eaten (like the heads, feet and
	intestines), cleaning, grading, chilling and cutting the carcass to the meat cuts required,
	and packaging ready for distribution. (See section: Steps in Processing).
Quarantine	isolation to ensure disease is not introduced and spread, or disease can not spread from
	a particular site.
Quarantine facility	a special, isolated building which is managed so that disease agents can't get into it or
	escape from it.
Rearing farm	a farm which raises meat chickens from the age of one day until they are ready for
	processing.
Rice hulls	the outer part of the rice grain, used as a bedding material on the floor of sheds for
Colortino harro Para	Cnicken.
selective breeding	a process of developing a breed of bird to have particular characteristics by choosing to mate only the best cockereds (such as those which grow better, are balthier or have
	more meat) with the best hers
Setter	a machine which incubates eggs through most of their development by replicating the
Setter	conditions provided by a hen, such as by controlling temperature and humidity and
	turning eggs regularly.
Silos/Feed silos	large storage bins used to hold bulk grains or animal feeds.
Stunned	rendered instantaneously unconscious and unable to feel pain, usually by application of
	an electrical current.
Table Eggs	eggs sold for eating. The meat chicken industry does not produce table eggs.
Vaccination	treatment of chickens with a mild or killed strain of a particular disease agent to give
	them immunity against disease.
Ventilation	the movement of air through a chicken shed, usually by using fans to pull air through
	the shed, to provide airflow and cooling to chickens.
Water lines	equipment which runs through the shed to supply birds with water.
Wild birds	any birds that live in the wild without human care.
Value added	changing a product in some way to increase its value to the consumer, for example by
	cooking, marinating or spicing it, or forming it into a product that requires very little
	preparation in the home.
Vertical integration	refers to companies which own all or many of the steps in the production process
	within the company eg breeder farms, hatcheries, feed mills and processing plants.



Steps in Processing

Processing involves the following steps:

• Trucks carry crates (or modules) of birds to the processing plant and are unloaded into the covered animal and holding area.

• Crates are unloaded either by hand or mechanically.

• Birds are placed on the processing line by hand. Within a few seconds they are stunned, usually by an electrical current, which renders them instantaneously unconscious and unable to feel pain.

• Within seconds the unconscious birds are killed by having their necks cut by a mechanical cutter. A person checks to ensure that birds are killed properly.

• Bleed out and scald tank - the dead birds are then hung so that they fully bleed out, before the carcass goes through a scald tank of hot water to loosen the feathers so the carcass can be plucked.

• Plucking - the carcasses then move through a machine where the feathers are plucked out by rotating 'fingers' or 'paddles'.

• Wash down - the carcasses go through a spray wash.

• Head removal and hock removal - the carcasses pass over a machine which removes their heads and feet.

• Evisceration - machines remove the viscera, that is, the digestive tract and other internal organs.

• Inspection - birds are inspected to ensure the machines have cleaned them properly.

• Inside/outside washer - carcasses pass through a washer where they are sprayed inside and out with jets of water to clean them.

• Pre-chiller - the carcasses go through a tank of chilled chlorinated water where the temperature of the carcass starts to be lowered.

• Chilling – chilling aims to drop the carcass temperature as quickly as possible to ensure that any bacteria are killed or unable to grow. There are two methods used in Australia: Spin-chiller - the carcasses are rapidly cooled in a large tank of chlorinated iced water where they are held until their temperature is very low. Air chilling - the carcasses are hung in a super cooled room.

• Rehang - carcasses are manually rehung after spin chilling onto the packaging line.

• Inspection point - carcasses are inspected for bruising or other damage or imperfections.

• Weight drops - carcasses that will be sold as whole birds are automatically weighed and dropped into bins according to their weight. They then go on to be packaged.

• Cut-up - carcasses selected to go for cut-up or further processed products are dropped from the grading line into cutup bins. Carcasses destined for cut-up will normally be rehung, and cut-up by a machine that automatically cuts the carcass into a range of pieces. Some carcasses may also be cut up manually.

• Further processing, filleting and deboning line - most filleting is done manually. In this process, the breast fillets are removed from the frames by a team of workers.

• Packaging - products are packaged in a variety of ways (eg; onto plastic film wrapped trays, as whole birds in bags, into plastic-lined product tubs or boxes), depending on the market.

• Cool room and distribution - after packaging, products are moved into the plant cool room to await distribution, or into the freezer room (for products to be sold as frozen).



Scientific Method

Scientific enquiry consists of **observation** and **experimentation**. An informed observer i.e. a person who has some background knowledge in a field of study, makes an observation and then, using prior knowledge, generates an **hypothesis** or educated guess.

The hypothesis is tested by designing an experiment. An **experiment** will include two variables:

- independent variable (also called experimental variable)
- **dependent variable** (the variable which is being measured)

The example given in Silverthorn's book is the observation made by a biologist that birds at a garden feeder appear to eat more feed in winter than in summer. Her hypothesis is that cold temperatures lead to increased feed intake in birds. She designs an experiment where she houses birds at different temperatures (the independent variable) and measures their feed intake (the dependent variable).

Every experiment must have a **control** which is a group which is exactly the same as the experimental group in every way except that the independent variable is not changed from its initial value. In the example from Silverthorn's book, the control group would be birds which are maintained at a warm summer temperature.

The information collected during the experiment is called **data** (plural, the singular of data is **datum**). In biological systems, there is variation among individuals so it is important to have **replication** in an experiment.

When an hypothesis is supported by many experiments, it may become an **model**. If a model has substantial scientific evidence supporting it, it may become a **scientific theory**.

Another way of addressing the extent of variability in a biological population is to use a **crossover study** where each individual acts as its own control. Each individual has the dependent variable measured under both control and experimental conditions.

When experiments are conducted with humans, there can be particular difficulties because of psychological factors such as the **placebo effect** where a person feels better because they are taking a treatment, even if they are just receiving the control treatment such as a sugar pill. Another condition is the **nocebo effect** where people who have been warned that a drug may have specific adverse side effects report a higher incidence of such side effects than people who were not warned. Because of these effects, experiments with humans may be conducted as **blind studies** where the participant does not know what treatment they are receiving. Another problem with human experimentation is potential bias on the part of the experimenter where the experimenter expects a particular outcome. In order to avoid this problem, a **double blind study** can be conducted where neither the participants nor the experimenter know what the treatments are.

Ethical issues arise with the use of animals or humans as experimental subjects or participants. You need to be familiar with the ethical requirements for your school prior to conducting any experiments. Your teacher will be able to help you with this.

Sources of Information

Silverthorn, D.U. 2010. Human Physiology An Integrated Approach. 5th Edition. Pearson International Edition. pp. 8, 10, 11, 14.

The National Primary Industry Centre for Science Education (PICSE) Resources "Aspects of Experimental Design". http://www.utas.edu.au/sciencelinks/resources.htm



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N.B. This information is provided for assistance only. The Poultry CRC does not endorse any of these suppliers.

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Information about Animal Welfare Requirements

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http://www.schools.nsw.edu.au/animalsinschools/index.htm

For specific information about poultry go to: <u>http://www.schools.nsw.edu.au/animalsinschools/resources/teachingideas/awia/teachmaterial</u> <u>s/index.htm</u> and click on the poultry options

ACT

http://www.det.act.gov.au/teaching_and_learning/curriculum_programs/animals_in_schools

VIC

http://www.education.vic.gov.au/management/schooloperations/animalcare/schools.htm

SA

http://www.decs.sa.gov.au/animalethics/pages/cg0001037/16305/?reFlag=1

TAS

http://resources.education.tas.gov.au/item/edres/f1eefb48-099e-6d52-95b6-2ffcfd9ba812/1/Guidelines1996.doc

QLD

http://education.qld.gov.au/curriculum/area/science/animals-ed.html

WA

http://policies.det.wa.edu.au/our_policies/ti_view?uid=e023bc342e2c59482edd1c2e27d57d9 2&iview=summary_view